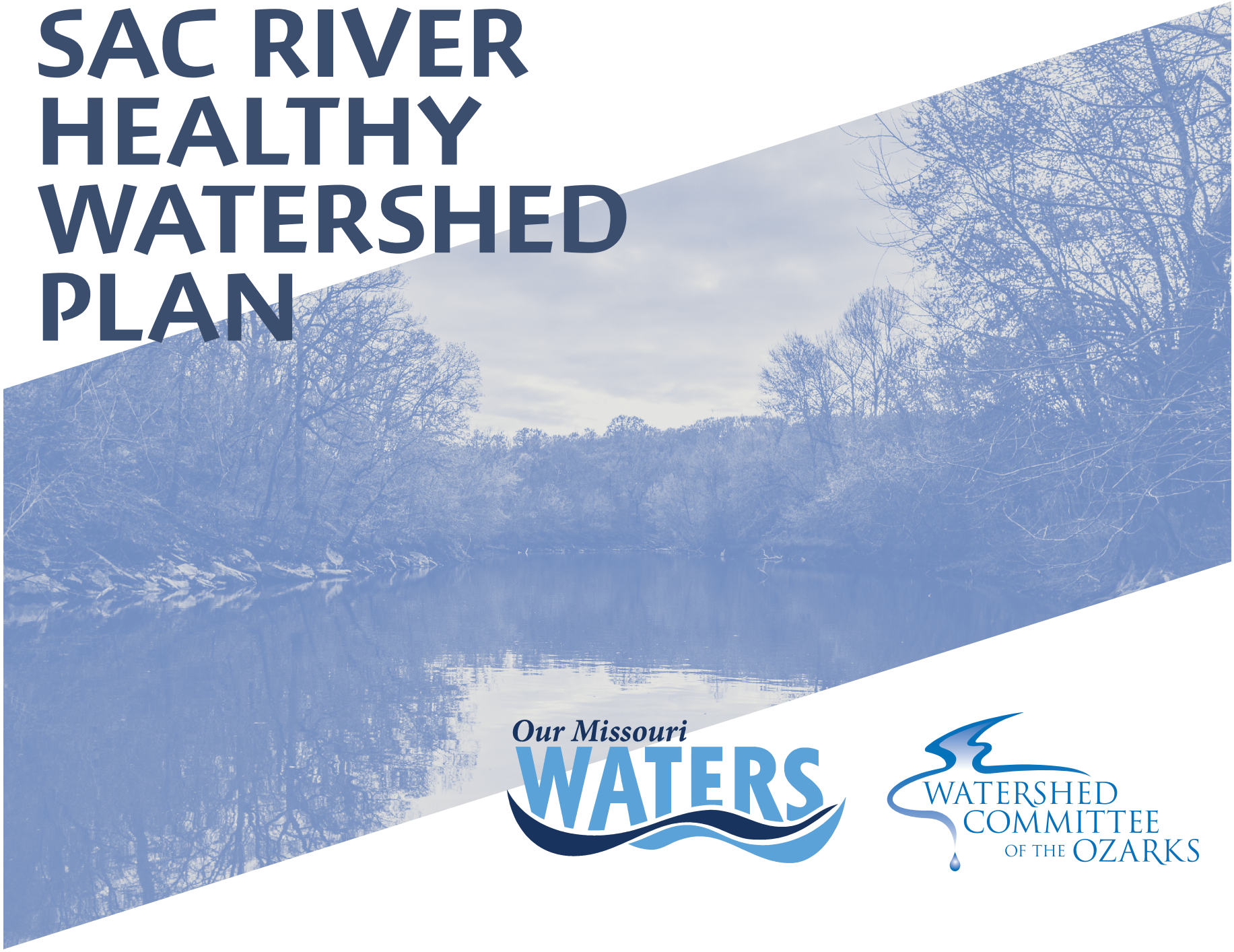
# SAC RIVER HEALTHY WATERSHED PLAN



Our Missouri WATERS

WATERSHED COMMITTEE OF THE OZARKS

# Sac River Healthy Watershed Plan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WATERSHED COMMITTEE OF THE OZARKS

# Executive Summary

On May 1, 2015, the Missouri Department of Natural Resources awarded the Our Missouri Waters Collaborative project for the Sac River watershed to the Watershed Committee of the Ozarks. The goal of this project was to gather local input and identify water resource priorities through community meetings. Community meetings were held to reach citizens living and working in the Sac River watershed, asking them to voluntarily serve on an advisory committee to identify and develop resources to achieve those priorities. Citizens, community leaders and elected officials in the watershed were invited to participate in this process to share how they use water and what is needed to continue protecting and enhancing the Sac River watershed. The summary and recommendations of the process are outlined in this document, the Sac River Healthy Watershed Plan. This plan will be a living, working document to help maximize resources and focus watershed priorities over the next five years. To learn more about the Our Missouri Waters statewide initiative, visit http://dnr.mo.gov/omw/.

CHAPTER 1

# Background & Introduction

## Watershed Characteristics

The Sac River watershed covers 1,981 square miles and includes Stockton, Fellows and McDaniel Lakes. The watershed contains 2,633 miles of streams, 74,892 acres of lakes and 303 known springs. According to the 2010 census, the largest cities in the watershed include: Springfield, with a population of 166,810 people; Republic, with a population of 16,005; Willard, with a population of 5,454; and Stockton, with a population of 1,859. Few changes in land use have occurred from 2001 to 2011. This change comprised less than a one percent difference overall, while there was a slight increase of 0.1 percent of impervious surface area. As this watershed is largely rural, nonpoint source pollution contributors are relevant to the overall health of the watershed. Some counties in the watershed did experience population growth from 2006 to 2010, as Greene and Polk counties grew by fifteen percent.

## Geology & Groundwater

Two aquifers lie under the Sac River Watershed. The Ozark aquifer is a high-yielding, deep, confined aquifer of generally very good quality. It provides for municipal, agricultural and industrial water. The Springfield plateau aquifer is a shallow, unconfined aquifer located from near the surface down to 200–300 feet and is recharged by precipitation. The shallow aquifer was generally of fairly good quality and was a major drinking water supply resource until the mid-1950s. Karst geologic conditions in the Springfield area can result in contamination to the shallow aquifer, combined with improper investigation and construction techniques. Contamination of this aquifer has prompted stricter regulations for wells, which are now required to be drilled to the deep aquifer and cased through the shallow aquifer. Most of the domestic water is now pumped from the deep Ozark aquifer, but the Springfield plateau aquifer still provides agricultural and industrial water.

Groundwater quantity is important to consider as groundwater levels in the predominant aquifer of the area, the Ozark aquifer, are declining in some areas of high use. Water conservation efforts by groundwater and surface water users can be implemented to help mitigate impacts of increasing water needs in the area. Missouri shares water resources with many other states, some of which regulate water use and have already established their demand for water. It is important for Missouri to document its need for water and to protect the right to that water. Registering major water use, annually, establishes a user's need for water and helps the state understand the water needs of Missouri citizens. Carbonate bedrock and associated karst topography (including abundant losing streams and sink areas) in the southern half of the basin make pollution-prevention measures a priority. Within the basin, stream types transition from typical clear, gravel bottom streams of the Ozark highlands to silt- and sand-bottomed prairie-type streams more typical of the Osage Plains. Relatively low potential for surface to groundwater contamination exists in the northern reaches of the basin due to the restrictive permeability of bedrock.

### Objectives

**Objective #1:** Build local understanding of water resources and programs available

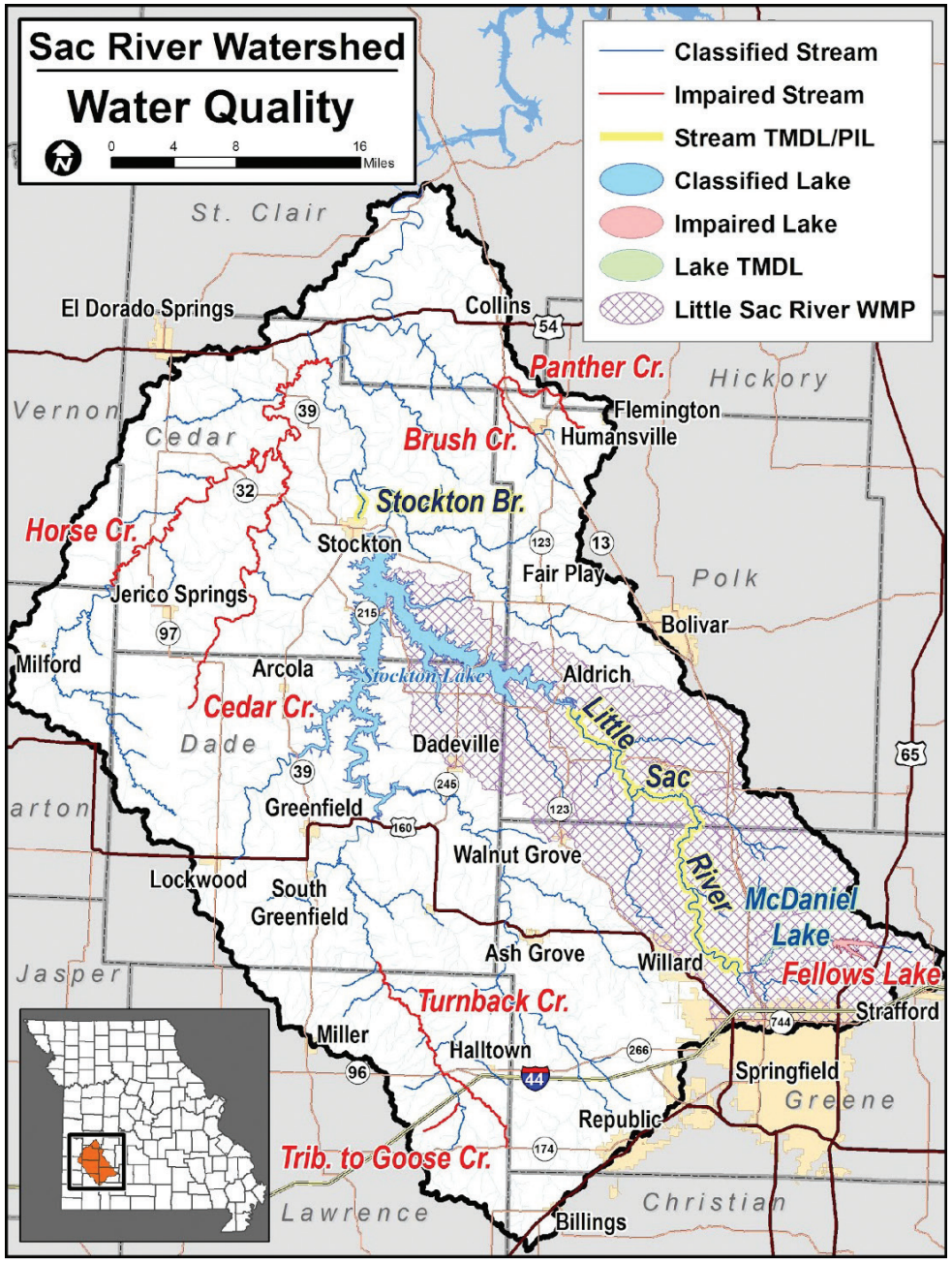
**Objective #2:** Local citizen engagement with community meetings to find local watershed priorities for the next five years

**Objective #3:** Assemble a local Watershed Advisory Committee to rank priorities and develop the next steps

**Objective #4:** Create the Sac River Healthy Watershed Plan

## Water Quality

In the southern portion of the watershed, there are challenges regarding bacteria levels in bodies of water, which can cause serious public health and recreational safety issues. Nonpoint sources of contamination, such as animal waste and contaminants carried by stormwater runoff, can have a serious cumulative impact on surface waters in a largely rural watershed. However, agricultural best management practices can significantly




reduce nonpoint source impacts. Pollution prevention is also critical due to connectivity of surface water and groundwater. Point and nonpoint sources of pollution to bodies of water, or in and around karst features such as sinkholes, can lead to regional contamination of groundwater wells and springs.

In the northern portion of the watershed, low dissolved oxygen levels in waterbodies often cause negative impacts to aquatic life and create challenges for the watershed. These low dissolved oxygen levels are often a result of excess organic materials, which consume oxygen, and may be discharged from wastewater treatment system types less effective in removing organics. Other sources of excess organics in bodies of water may include animal waste, nutrient loads (fertilizer) and sedimentation from streambank and erosion.

Section 303(d) of the Federal Clean Water Act requires each state identify waters that do not meet water quality standards and for which adequate water pollution controls are not in place. These identified waters are considered impaired. Water quality standards protect beneficial uses of water such as making whole-body contact (e.g. swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife.

In 1998, the Little Sac River was placed on the 303(d) list for bacterial contamination, for which a TMDL (total maximum daily load) for fecal coliform was approved in 2006. The following lake and streams within the watershed are listed on the state's 2012 list of impaired waterways and are presented on map in figure 1. Turnback Creek (E. coli), tributary to Goose Creek (E. coli), Horse Creek (aquatic macroinvertebrate assessment), Cedar Creek (aquatic macroinvertebrate assessment), Panther Creek (dissolved oxygen), Brush Creek (dissolved oxygen) and Fellows Lake (atmospheric deposition of mercury).

Impairments can be caused by known sources like point or nonpoint source pollution, or may be unknown; however, identifying activities near impaired bodies of water can provide key information in determining the sources of contamination, as well as developing solutions for impaired waters.

Examples of point sources of pollution include municipal

***Figure 1:*** *Map of water quality impairments in the Sac River watershed from 2012 303(d) list*

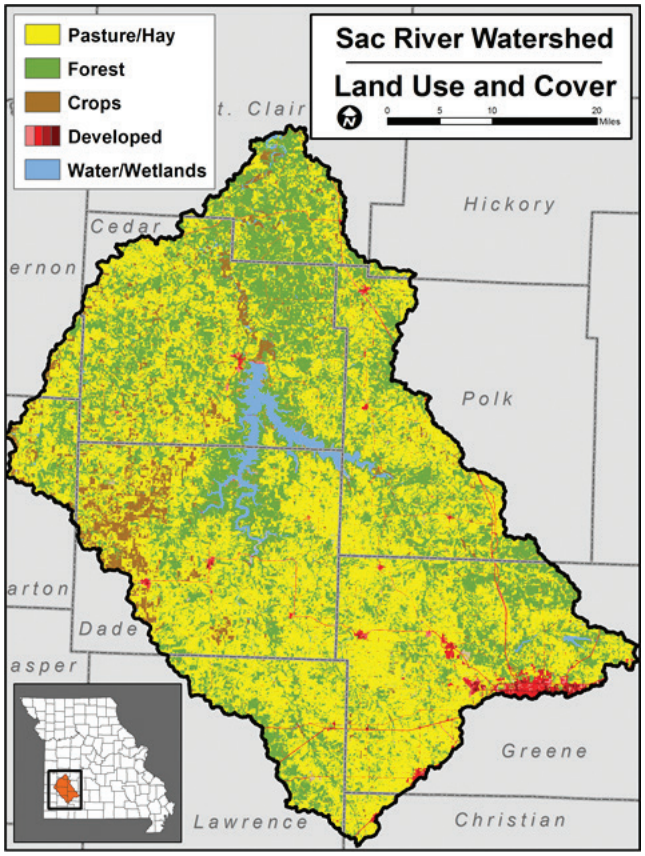



***Figure 2:*** *Map of land use in the Sac River watershed*

wastewater treatment plants, land disturbance sites, large confined animal operations and treated industrial wastewater discharges. Common challenges for wastewater treatment include the limited contaminant removal capacity of certain types of treatment. When facilities experience difficulty in providing the proper level of treatment and contaminant removal, the Missouri Department of Natural Resources (MDNR) often works with them to improve the treatment process and quality of the discharge. In the case that point source emitters are unwilling to improve the quality of their discharge, the department has regulatory authority to ensure that inappropriate discharges are discontinued in a timely manner.

*In early spring, anglers float Turnback Creek in search of white bass and walleye.*

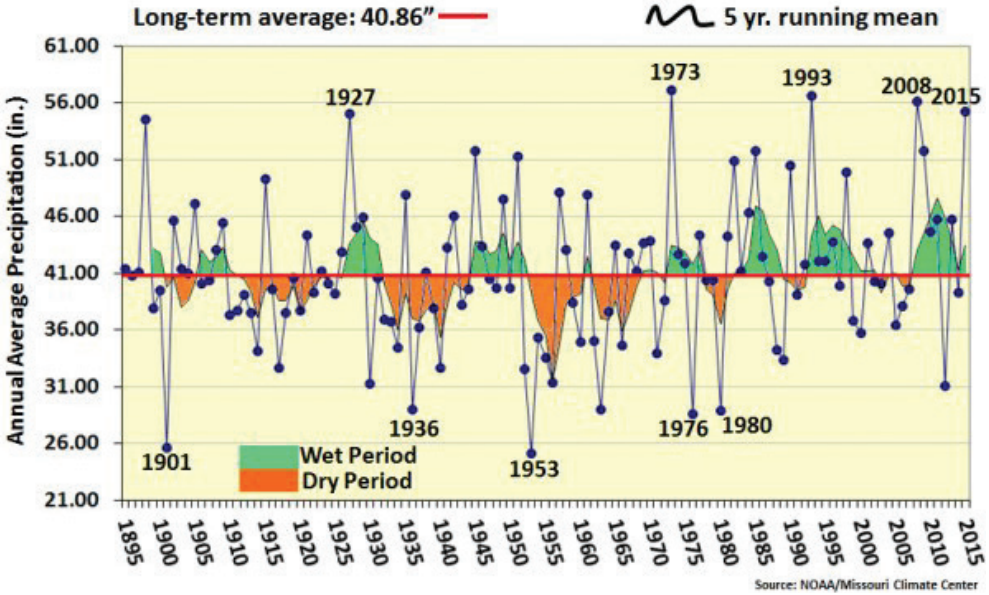
The National Pollutant Discharge Elimination System (NPDES) permit program was created in 1972 by the Clean Water Act and helps to address water pollution by regulating point sources that discharge pollutants to waterways. NPDES-permitted facilities, shown in figure 7, have to comply with permit requirements and are inspected regularly by MDNR.

Nonpoint source pollution sources refer to contaminants that do not come from specific conveyances and may come from multiple sources, such as failing septic systems or contaminants carried in stormwater runoff from rural, urban and agriculture lands. Everyone that lives or works in the watershed contributes to nonpoint source pollution. Anything that is on the ground can get in our waterways, which is why being proactive to protect our watershed is cost-effective and essential. Other causes of impairments to bodies of water include natural causes like precipitation, climate and drought, which can alter stream flow and channel characteristics, leading to changes in water quality.

## Land Use

A large portion of the Sac River Watershed is located in the

***Figure 3:*** *Chart showing the annual average preciptation in Missouri from 1895 to 2015, overlaid with a five-year mean.*



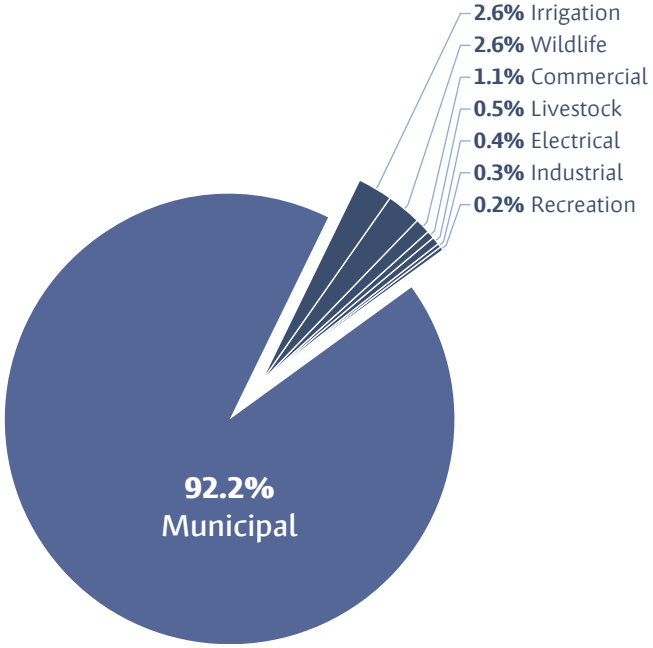




***Figure 4:*** *Estimated annual major water use in 2013 (data from Missouri Department of Natural Resources)*

Ozark Border Major Land Resource Area (MLRA). This area is part of the northeast and central farming forest region. The Ozark Border MLRA is comprised of approximately 35 percent forest, 25 percent pasture (mainly of introduced grasses and legumes) and 40 percent cropland. Feed grains and hay are the main crops. Summer droughts and steep slopes limit the use of the land for crop production. Shallow wells, small creeks or springs are often used for livestock needs. Deep wells supply water for drinking and high-volume uses.

This area supports oak-hickory forests. The grassland supports a combination of introduced and native tall-prairie grasses consisting mainly of Indian grass, little bluestem, big bluestem and switch grass. Introduced grasses include fescue, annual crab grasses and Kentucky bluegrass. The pastures are mostly in fescue grass over-seeded with red clover.

The watershed consists mostly of grassland, 67 percent, and forests, 30 percent. The grassland designation includes hay, pasture and land enrolled in the Conservation Reserve Program (CRP). Hay and CRP land, which are sometimes considered cropland, behave more like grassland in terms of runoff, erosion and nutrient loads, and have been left in this class. Urban areas comprise 2.4 percent of the watershed. A high contamination potential exists due to the high urban population density and the amount of impervious surfaces. Estimates indicate that the most urbanized portion of this watershed has about 25 percent imperviousness.

As this watershed is largely rural, nonpoint source contributors are relevant to the overall health of the watershed. The City of Springfield and the surrounding urban areas also have a significant influence on stream conditions in the watershed due to their proximity to the headwaters of the Sac River.

## Climate & Water Availability

Missouri precipitation data from 1895 to 2013 shows annual

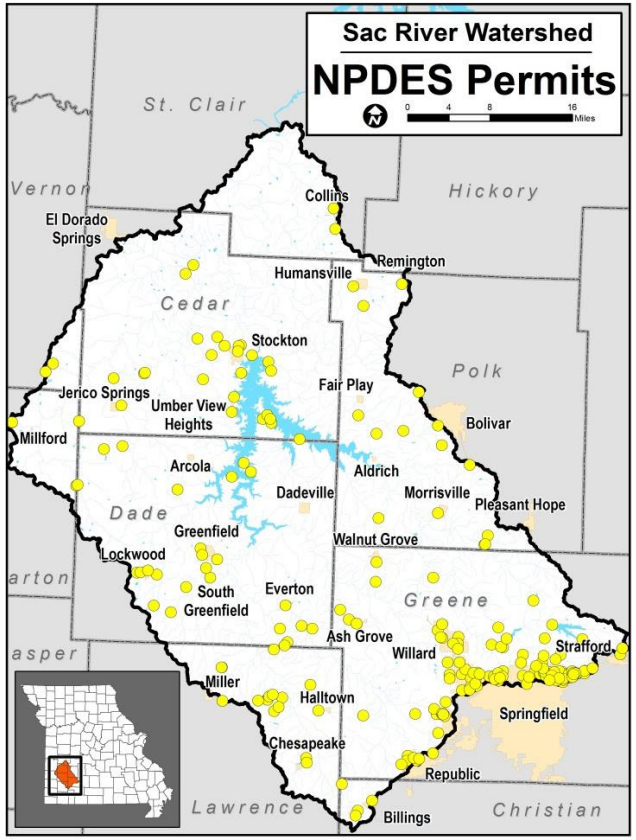



***Figure 5:*** *Map of NPDES (national pollutant discharge elimination system) permits in the Sac River watershed*

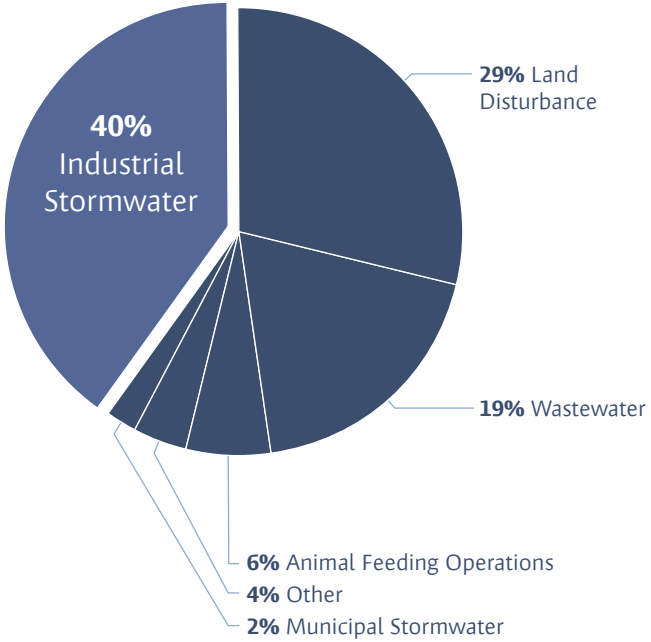



***Figure 6:*** *Graph of the type of NPDES permits issued in the Sac River watershed*

average statewide precipitation in figure 3. A five-year trend line reveals several wet periods have dominated since the early 1980s, and this wet pattern has been accompanied by an increase of heavy precipitation events. Severe drought occurred during 2012, but this drought was brief compared to major multiyear droughts that occurred in the 1930s and 1950s. Tree ring analysis, which provides data prior to written records, also shows multiyear severe droughts in Missouri's history. Both data sets indicate multiyear severe droughts are likely to occur in the future.

Thirty major water users are registered in the basin. A major water user is defined as the capacity to withdraw more than 70 gallons per minute or 100,000 gallons per day. The reported estimated annual water use as of 2013 is 8.1 billion gallons, of which 83 percent is diverted surface water and 17 percent is groundwater. The majority of water diverted is used for municipal drinking water (92.2 percent). Water reporting is encouraged but not required, so there could be major water users in the watershed that are not reporting data.

There are 110 public drinking water systems serving approximately 235,701 people. Water systems that are required to report to the department show that approximately 35 million gallons of water are consumed per day. There are 82.5 million gallons of available drinking water capacity per day for public water use.

CHAPTER 2

# Collaborative Watershed Process

The Sac River Watershed encompasses portions of Cedar, Dade, Lawrence, Greene, Polk, St. Clair, Vernon, Barton, Christian and Hickory counties, and includes the towns of Springfield, Republic, Bolivar, Willard, Ash Grove, Greenfield, Stockton and Walnut Grove. In an effort to engage members from all these areas within the watershed, informational community meetings were hosted in three different geographic locations throughout the watershed. Those community meetings were held on Nov. 17 in Stockton, Dec. 15 in Greenfield and Jan. 12 in Willard, with a total of 142 meeting participants. Of those participants, 66 completed and submitted surveys during the meetings with most couples submitting one survey together. All the information provided through the survey was shared by email with all the meeting attendees that submitted contact information. The survey asked participants if they are interested in voluntarily serving on the Sac River Watershed Advisory Committee (WAC). The only requirement to serve as a WAC member is to be a resident or property owner in the Sac River Watershed. Thirty-four survey respondents expressed interest in serving on the WAC. Those that expressed interest were contacted, asked if they owned property the Sac River Watershed, and if they would like to serve on the committee. Twenty-four of those respondents committed to serving on the WAC. The WAC also received a summary of the community survey results. The complete survey results can be found in Appendix D on page 18.

To reach people that live and work in the watershed, informational flyers and press releases were submitted to local media to help publicize the community meetings. Local community leaders and regional groups in the watershed were notified of meetings by phone and email, including Missouri Farm Bureau, soil and water districts, city clerks, mayor's offices, local Stream Teams, Lakes of Missouri Volunteer Program, local newspapers and media stations, U.S. Army Corps of Engineers, Missouri Department of Conservation, county commissioners, state representatives, local green teams and Watershed Committee of the Ozarks' comprehensive contact list.

**Figure 7:** Sac River Watershed Advisory Committee Members

| Name | Location in Watershed |
|---|---|
| Michael Cheek | Dunnegan |
| Dale Cornelius | Dadeville |
| Dwight Crevelt | Walnut Grove |
| Billy Dryer | Greenfield |
| Robin Farmer | Greene County |
| Bob Glenn | Everton |
| Casey Groose | Walnut Grove |
| Tom Huff | Greene County |
| Connie Ian | Stockton |
| Frank Johnson | Greenfield |
| Theresa Johnson | Greenfield |
| Lynden Kenney | Stockton |
| Peggy Kenney | Stockton |
| Jeanie Mayer | Greenfield |
| Martha Molz | El Dorado Springs |
| Clark Montgomery | Cedar County |
| Eric helton | Springfield |
| Todd Wagner | Springfield |
| Beth Walker | |
| Holly Welch | Bolivar |
| Jeff Wilkins | Lockwood |
| Brian Worthington | |
| Bob Zwingle | Greenfield |

The Cedar County Republican, Cross Country Times (the local Willard newspaper which includes the Ash Grove Commonwealth newspaper), KSMU, KY3 and the Southwest Missouri Council of Governments quarterly newsletter published information

about the community meetings. The first informational community meeting was held Tuesday, Nov. 17 in Stockton at the Cedar County Health Complex. There were forty people in attendance, which included a diverse group of local community leaders, citizens and governmental organizations. DeDe Vest was the meeting facilitator, and presenters included Jennifer Hoggatt with MDNR, Stacey Armstrong with Watershed Committee of the Ozarks, Tony Thorpe with Lakes of Missouri Volunteer Program, and Kara Tvedt and Ben Parnell with Missouri Department of Conservation. Nineteen surveys were collected at the first meeting. The next two community meetings included the same format and informational presentations to allow for communities in different locations in the watershed to receive the same information without having to drive too far. The second community meeting was held Dec. 15 at Greenfield High School with 40 in attendance, and the third was held Jan. 12 at the Willard Community Center with 61 in attendance.

## Sac River Watershed Advisory Committee

The WAC is formed of voluntary landowners that live or work in the Sac River watershed. The committee is a diverse group of individuals that represent different geographic areas in the watershed. The committee went through a facilitated process that allowed each person to share their thoughts and discuss the resource concerns for the watershed. From that process, the committee created a list of watershed priorities to be the focus for the next five years and listed possible solutions to those problems. A list of committee members and the locations they represent in the watershed is found in figure 7 on page 8.

The voluntary local WAC was assembled and held their first facilitated meeting in Greenfield on Feb. 23. Twenty-six landowners participated in the first committee meeting. The public survey results were presented to the committee and were also shared with every participant of the introductory community meetings. During the facilitated meeting, committee members broke out into three category groups of Agriculture, Water Quality and Recreation, then discussed and created a list of watershed concerns or problems (found in figure 9 on page 10). Watershed Committee of the Ozarks provided educational materials and field trips based on the topics and questions generated.

The first educational presentation was by U.S. Army Corps

*A series of meetings were held in different communities throughout the Sac River Watershed.*

**Figure 8:** Sac River Watershed Meetings

| Date | Location | Attendance | Format |
|---|---|---|---|
| Nov. 17, 2015 | Stockton Health Department Community Room | 41 | Introductory Community Meeting |
| Dec. 15, 2015 | Greenfield High School Library | 40 | Introductory Community Meeting |
| Jan. 12, 2016 | Willard Community Building | 61 | Introductory Community Meeting |
| Feb. 23, 2016 | Greenfield High School Library | 26 | WAC Facilitated Meeting |
| March 24, 2016 | Stockton Dam | 15 | Educational Tour |
| April 19, 2016 | Greenfield High School Library | 18 | Educational Presentations for WAC |
| May 3, 2016 | Greenfield High School Library | 13 | WAC Facilitated Meeting |
| May 17, 2016 | Willard Community Building | 19 | WAC Facilitated Meeting |

## Figure 9: Resource Concern List

At the Feb. 23, 2016, meeting, the Sac River Watershed Advisory Committee compiled a list of resource concerns.

**Drinking Water/Pollution/Monitoring**
- Wastewater overflow from cities
- How many municipal/wastewater and private systems are in the watershed?
- What are municipal standards and how well are the systems meeting standards?
- How do the municipal inputs affect the overall health and regulations of river and lakes?
- What municipalities use water from Stockton? Surface water in Sac River Watershed?
- How are groundwater levels? If declining, it's a problem
- Use testing to determine source, more information needed
- Urban runoff, stormwater, nonpoint pollution, impact?
- More testing to identify sources of pollution
- Is there a problem worthy of action?
- How much monitoring is done, who does it and where?
- What impact does Springfield Landfill have on Sac River Watershed?
- Why does Springfield allow outsiders to bring trash? How does that work?
- Erosion problem, especially streambank
- Trash problem
- Problem educating citizens to prevent erosion, trash, other issues
- Connecting people to available resources
- Erosion and sediment from county (unpaved) roads
- Confined animal feeding operations, if they pollute
- Why are impaired streams impaired—by what, how is it measured, how can it be helped?
- If livestock uses streams and property is fenced out, what watering alternatives are available from Stockton?
- Potential problem: flood control, especially in urban areas and towns
- Is there data on septic systems—where they are and their impact?
- How many abandoned wells are there and what can we do to cap them?
- Sinkhole management and education; get the word out; where are they?
- Where are abandoned mines? Is lead and zinc an issue? Are shafts a danger?
- If you are sick, you go to the doctor to get tests. Are our waters sick, and how do you test it?
- Separation of TMDLs (total maximum daily load) between urban-origin streams and agriculture-origin streams
- Construction (especially homes) within flood plains.
- Sinkholes and caves—the protection of those is a BIG issue within this watershed because of the potential impacts on drinking water supplies

**Recreation/Tourism/Economy**
- Education
- Boating safety
- Nutrient loading for fish production
- Potential pollution from recreational vehicles
- Trash
- Non-native wildlife
- Infringement of trails

**Agriculture/Wildlife**
- Regulation—common sense
- Remain voluntary
- Promote existing programs
- Landfill
- City sewer facilities
- Precision fertilizer
- CAFO-regulation
- Corps of Engineers
- Poultry
- Education Transparency
- How do soil types play into water movement through the soil?
- Nutrient pollutant translocation
- Stockpiling animal wastes for fertilizer spreading on fields
- DNA testing on water E. coli
- Stream corridor/buffer destruction by land owners on all streams.
- Gravel mining
- Fish passage barriers (mill dams, low water crossings, culverts, etc.)
- Cattle around sinkholes and streams causing high nutrients and bacteria in groundwater and surface water

## Figure 10: Resource Concern Priorities

At the May 3, 2016, meeting, the Sac River Watershed Advisory Committee developed a ranked list of resource concerns.

| Rank | Resource Coccern | Points | People |
|---|---|---|---|
| 1 | Urban Runoff | 18 | 8 |
| 2 | Streambank Erosion | 14 | 7 |
| 3 | CAFOs | 11 | 5 |
| 4 | Municipal Waste | 10 | 6 |
| 5 | Animal Waste | 7 | 4 |
| 6 | Nutrients/Stormwater Runoff | 5 | 2 |
| 7 | Septic Tanks | 5 | 2 |
| 8 | Lack of Knowledge | 3 | 1 |
| 9 | Sinkholes | 2 | 2 |
| 10 | Genetic Testing (Bacteria) | 2 | 1 |
| 11 | Landfill | 1 | 1 |

of Engineers Water Management Department from Kansas City in March, which gave a background about Stockton Dam, how flows are calculated and information on the new turbine. The committee also went on a tour of Stockton Dam to see the facilities. The second educational meeting was held on April 19 in Greenfield where presenters provided information about watershed monitoring, soils, municipal wastewater systems and landfills. The presenters included: Dick Henderson with Soil Consulting; Trish Rielly with MDNR's Monitoring and Assessment Unit; Brian Wirth, superintendent of Clean Water Services with the City of Springfield; and Barbara Lucks, sustainability officer with the City of Springfield.

The committee's second facilitated meeting was held May 3 at the Greenfield High School Library to discuss watershed priorities. Thirteen committee members were in attendance. Using the concerns list created during the February meeting as a guide, they wrote down their top three concerns on sticky notes, then placed the sticky notes on the wall and grouped them into categories. The group then received numbered stickers and were asked to

place the sticker with the highest number on their top priority, the following number on their second priority and so on until they had voted with all of their stickers. The numbers were then added up and the priorities were listed from highest total of points to the lowest. (The "Resource Concern Priorities" list created by the committee is found in figure 9 on page 10.) The committee discussed urban runoff, CAFOs, municipal waste, and nutrients/stormwater runoff, and also created a list of problems and solutions for each resource concern.

The committee's third facilitated meeting was May 17 at the Willard Community Center with 19 members in attendance. The committee discussed the resource concerns not fully covered in the previous meetings, which included animal waste, nutrients/stormwater runoff, septic tanks and lack of knowledge. The committee voted to decide if they wanted to meet again to discuss the list further. The majority voted that another meeting was not necessary.

## Watershed Priorities

Figure 10 summarizes the priorities that the WAC identified and discussed. The resource concerns are ranked in order of greatest concern, with one being the top concern. Under each resource concern, the landowners came up with a list of ideas on how to fix these problems. Lack of education was a topic that came up frequently and was connected to many of the solutions. The group agreed that continued educational opportunities for both the committee and citizens in the watershed would help solve watershed problems and potentially identify new solutions. Local citizens also need access to information about the resources and cost-share programs available to help make watershed improvements.

An extensive list of problems and possible solutions identified by the committee can be found in Appendix A on page 13. The committee held additional discussion on the following solutions:

### *Solution: Forming a Stream Team & Stream Team Water Quality Sample Collection*

The WAC decided to work towards forming a Stream Team group. The first introductory stream team workshop training opportunity will be in spring 2017. After forming a stream team, potential projects the committee discussed included storm drain stenciling, trash pickup, seedling planting and year-round water quality monitoring. To learn more about Missouri Stream Team, a volunteer partnership coordinated through the Missouri Department of Conservation, visit: http://www.mostreamteam.org.

*The Sac River Watershed Advisory Committee visits Stockton Dam.*

### *Solution: Educational Materials & Workshops*

The committee expressed a need for educational information for county offices to have available for residents within the watershed. The Watershed Committee of the Ozarks is working to update three educational factsheets on sinkholes, springs and streams to provide for the counties within the Sac River Watershed. Other educational materials currently available—including resources on maintaing on-site wastewater systems and protecting private wells—will also be shared with the county offices.

The Missouri Department of Conservation offers a free Stream Crossing workshop available for county commissioners and road crew staff. If a county within the watershed is interested

in these workshops, they can contact their local fisheries management staff with Missouri Department of Conservation to coordinate a program.

### *Solution: Cost-Share Opportunities*

The committee agreed that the local cost-share opportunities and programs currently available need to be easily accessible to the public. Many local landowners are not aware of the programs available. MDNR and Soil and Water Conservation Districts coordinate cost-share programs to help create nutrient management plans, soil tests, riparian corridor protection and improvements. You can contact these offices for more information:

- SWCD: http://swcd.mo.gov/ (to find your district)
- NRCS- USDA: http://www.nrcs.usda.gov/
- FSA: https://www.fsa.usda.gov/
- MU Extension technical assistance: http://extension.missouri.edu/
- MDC: https://mdc.mo.gov/

## Conclusion & Acknowledgements

This document and the information gathered during this project will be submitted to MDNR and will be utilized at the state level. It can also act as a guide for local landowners to know which watershed improvements to focus on over the next five years. This plan is meant to be a living, working document. Each year, it can be added to or changed as needed. In about five years, the state plans to re-evaluate the plan to see if all the suggestions have been implemented in the watershed. If the Our Missouri Waters effort and the Sac River Healthy Watershed Plan is found useful, then the same process could be followed for the next five years.

The Watershed Committee of the Ozarks would like to thank all of the individuals who participated in the Our Missouri Waters–Sac River Watershed project. A special thank you goes out to the voluntary members of the WAC. Your time is valuable and we appreciate the time and effort that was given to this process to discuss and create a priority list for the watershed. Input from people that live and work in the watershed is critically important to protect and sustain the water resources for generations to come.

APPENDIX A

# Advisory Committee's Problems & Solutions

## Urban Runoff (developed areas)

| Problems | Solutions |
|---|---|
| Fertilizer on lawns | Soil tests, lawn service providers, no fertilizer sales in spring/education |
| Pesticides and chemicals | Licensed applications/education |
| Parking lots, roofs, driveways, roads (impervious surfaces) | Greenways, buffers, absorption fields |
| Pet waste | Skip |
| Illicit discharges (oil) | Education, fines, storm drain stenciling |
| Wildlife in parks and golf courses | Geese, no mowing, changing ordinances |

## Streambank Erosion

| Problems | Solutions |
|---|---|
| U.S. Army Corps of Engineers | Streamline the permitting process |
| Southwest Power Administration | Find a different way to moderate the flow |
| Power target needs to be adjusted | Get documentation from MDC, DNR |
| Flow needs to be moderated | Get visible documentation with witnesses and notarized |
| Removing riparian corridor upstream from the dam or washed out | Much of the streambank erosion is caused by winter freeze/thaw |
| Improper gravel mining | Proper gravel mining |
| | Stream buffers |
| | Education about available programs |

## CAFOs (Confined Animal Feeding Operations)

| Problems | Solutions |
|---|---|
| Overspreading of litter, arsenic | Soil test before spreading, spreading in floodplains, litter test to determine amount |
| Regulations on decomposing birds/ disease? | Tighter regulations on litter spreading, state laws? |
| Heavy metals in litter | Nutrient management plans through Soil and Water Districts |
| HSUS facilities tied to CAFO regulations through litter | |
| Stockpiling litter | Better regulations on stockpiling animal wastes |

## Municipal Waste

| Problems | Solutions |
|---|---|
| Old pipes and stormwater | Grants for upgrading old infrastructure |
| Cracks in manholes | |
| Overflows during storms, aging infrastructure | |
| Effluent not to the stream, use the nutrients | |
| Biosolids spreading | |
| Pharmaceutical pollutants left in sewage treatment discharges | New sewage treatment technologies |

## Animal Waste

| Problems | Solutions |
|---|---|
| Chronic wasting disease/dead deer, blue tongue | Grazing systems |
| Cattle in streams | Education on proper management and programs available |
| Animal feeding operations (not CAFOs) | Twelve-month testing on impaired streams, no water = no fish |
| Ducks, geese/wildlife | Document rainfall amounts |
| People at the lake | Do not decrease deer harvest |
| Boating and recreation | Dumping stations at lake might need to be increased |
| | Proper disposal of dead animals |

## Nutrients/Stormwater Runoff

| Problems | Solutions |
|---|---|
| Improper application of chemicals or fertilizer | Education |
| Improper storage of chemicals or fertilizer | Bank stabilization |
| Private landfills | Precision application |
| Eroding streambanks or no buffers | Cost-share practices are available |
| Leaves in street or storm drains | Use more cover crops with crop farming |

## Septic Tanks

| Problems | Solutions |
|---|---|
| Installed too close to watershed/ waterway | Education so people understand how they work and placement |
| Breakout system overloaded with rainwater | Education on maintenance |
| Placement on shallow soils or karst areas | Information |
| Improper maintenance | Info pamphlets at courthouse, city halls and extension offices |
| Old systems not installed correctly | Financial assistance for replacing and maintaining systems |
| How many? Where? When last pumped? | Kassinger Basin |
| Some don't even have septic tanks | Loan/grant program |
| Lateral lines not installed correctly | Keep track of contaminated wells and areas they come from |
| Shallow to bedrock | |
| Only the old ones | |
| Unpermitted installation or regulations | |
| Flushing hazardous or unwanted things | |

## Lack of Knowledge

| Problems | Solutions |
|---|---|
| Lack of knowledge | Establish "official" watershed coalition for the Sac River |

APPENDIX B

# Community Meeting Survey

*This is the text of the survey distributed at the community meetings held in the Sac River watershed. Graphs illustrating the summarized responses are found in Appendix C, starting on the next page. Complete responses are found in Appendix D, starting on page 18.*

Background: The Watershed Committee of the Ozarks is partnering with the Missouri Department of Natural Resources on The Sac River Healthy Watershed Project. This project will gather local input on water resource priorities and form a local watershed advisory committee to identify and develop resources to achieve those priorities. As local citizen in the community your input on the following questions will help make this project a success.

1. What is your general perception of the Sac River and associated streams and lakes in your community? Please list local water bodies that are important to your community.

2. How do you and/or your community use the local streams, rivers and lakes?

3. What are the primary challenges with these water bodies?

4. What are the primary benefits of the water bodies here? For example: recreation, open space, economy, ecological benefits, etc.

5. What are the significant water uses in your community? How do these uses impact your community?

6. Do you feel there are any activities occurring upstream or downstream that impact your use of the river?

7. What would you like to see as a priority for the Sac River watershed in the next 5 years?
   Priority #1:
   Priority #2:
   Priority #3:

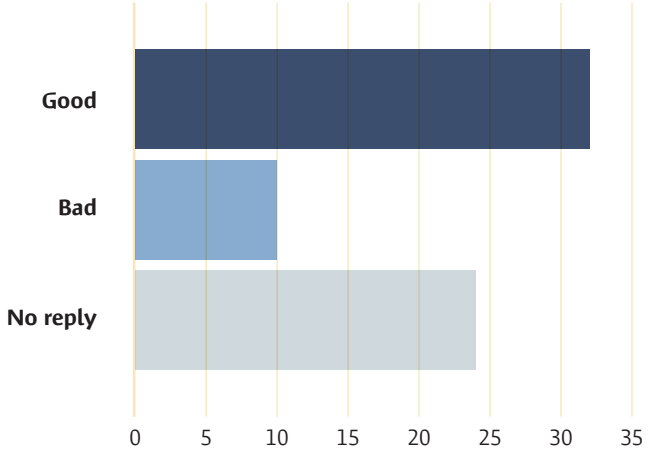
8. Would you be willing to serve on a Watershed Advisory Committee for the Sac River watershed? If yes, please provide name and email.

APPENDIX C

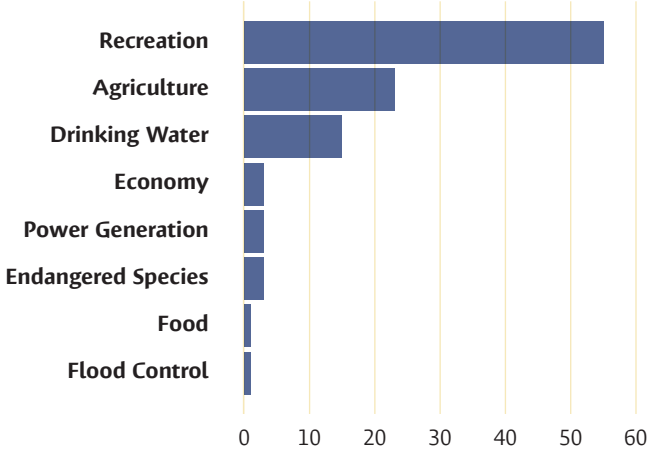
# Survey Response Graphs

*These are the summarized responses to the survey distributed at the community meetings. Complete responses are found in Appendix D, starting on page 18.*

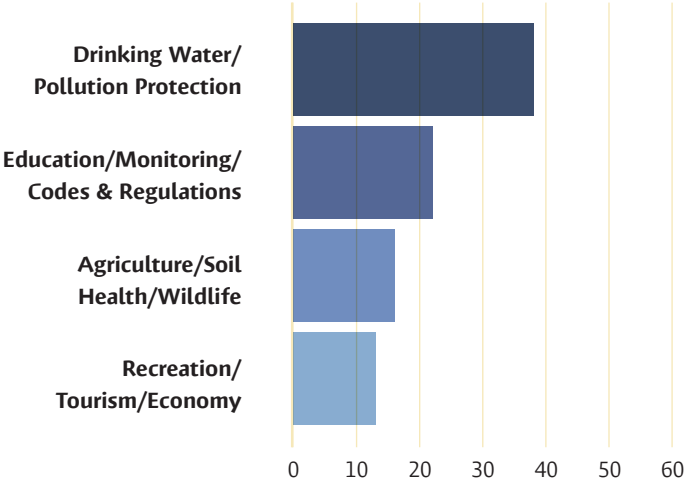
1. What is your general perception of the Sac River and associated streams and lakes in your community?



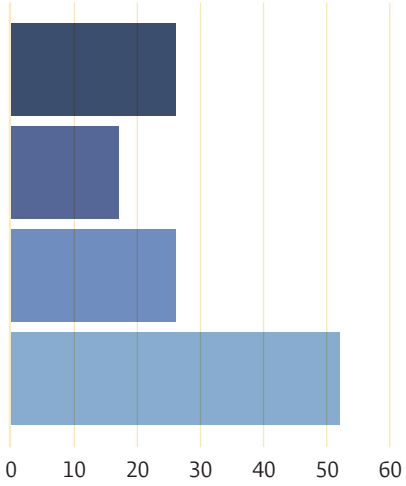

2. How do you and/or your community use the local streams, rivers and lakes?



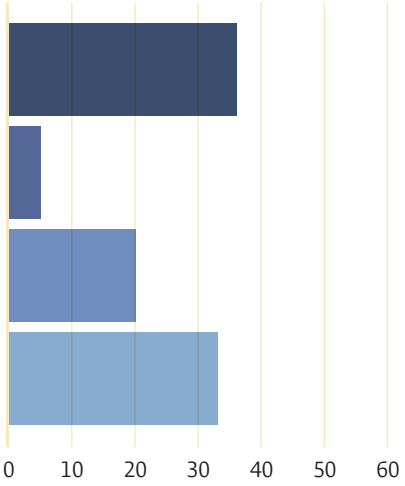

3. What are the primary challenges with these water bodies?



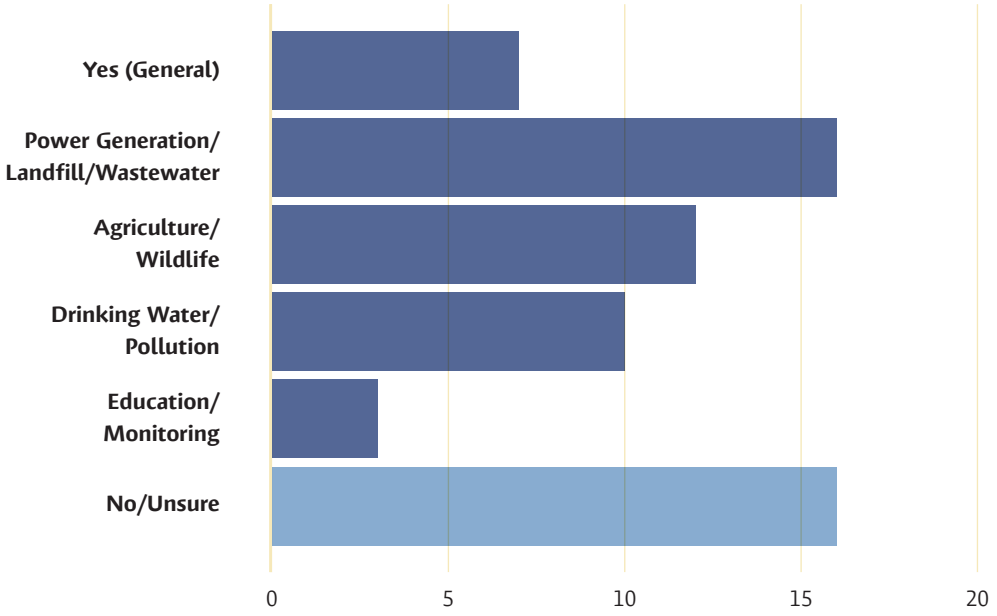

4. What are the primary benefits of the water bodies here?



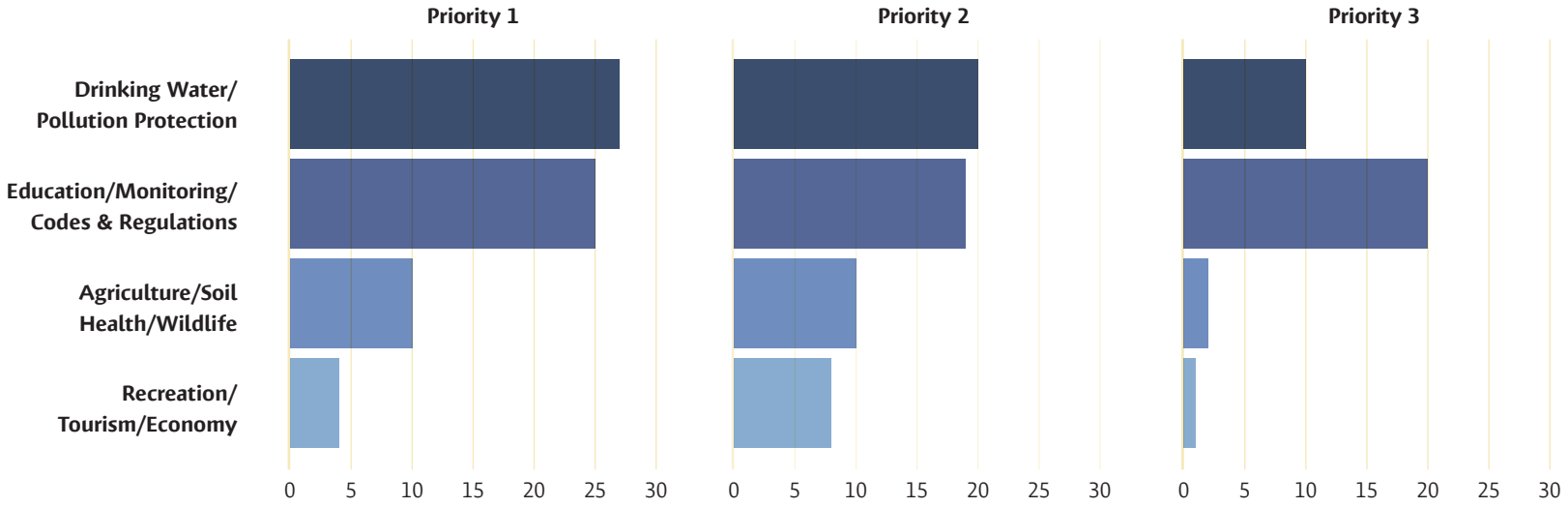

5. What are the significant water uses in your community?



6. Do you feel there are any activities occurring upstream or downstream that impact your use of the river?




7. What would you like to see as a priority for the Sac River watershed in the next 5 years?



APPENDIX D

# Complete Survey Responses

## Meeting 1: Nov. 17, 2015, at Stockton – 41 attendees, 19 survey respondents

| General Perception | Waterbody | Use | Primary Challenges | Primary Benefits | Community Uses | Upstream/ Downstream Activities | Priority #1 | Priority #2 | Priority #3 |
|---|---|---|---|---|---|---|---|---|---|
| Good overall | Stockton Lake, Sac River, Little Sac, Bear Creek, Cedar Creek, Horse Creek | Recreation, drinking water, livestock | Livestock access, pollution runoff | Recreation, economy, drinking water | Recreation, drinking water | No | Water quality monitoring | Invasive species monitoring | |
| Stockton Lake is key to our community that feeds into the lake must be monitored | | Recreation, sailing (lake is top 10 sailing lake in four states) | Make sure there are no pollutants | Tourism, to keep lake clean to promote new business | Fishing, which brings tournaments to community which brings people to purchase local products | Not sure; however, it is important for me to know and how we can connect | Chemicals need to be | Regular animal waste | Work with city of Stockton on their wastewater |
| Sac is muddier praire soil watershed vs. (lower clarity) James/ Ozark chert/gravel watershed (higher clarity) | | Fishing, swimming, canoeing, boating | Keeing water clean enough for swimming WBC | Rivers that only occur | Drinking water | Crop prices have driven more producers to clean up creek banks to plant more corn (high sediment and nutrients) | Soil health practices to mitigate lack of | Stream bank stabilization project, riparian buffer | Education outreach through get by people out of enjoy local waters |
| A wonderful set of resources. Stockton Lake is the main water resource we use | | Fishing, boat (kayak and fishing) and monitor water quality on Stockton Lake | Minimizing pollution (chemical, physical), providing adequate usage oppourtunites for a variety of intrests | Recreation and ecological | Recreational and water for farms and livestock impacts are economic and emotional | Concerned about any activities that pollute or contaminate the waters | Clean water (allow recreation as well as for aquatic organism health) | Water conservation | Riparian corridor maintenance |
| Seemed to be fairly clean bodies of water | Stockton Lake, Sac River | Recreational, cultural | The risk of having to provide water to other sources in Springfield; Stockton Lake has lots of traffic/recreational | Recreation, economic | Recreational, they provide a great deal of revenue we wouldn't have otherwise | Unknown | Keep our water/lake clean and clear | Community/ landowner impact | Impact positive to our economy |
| All are important | | Fishing, farming needs, other recreational uses | Too much government control | The natural needs, farming and recreation | Farming | Springfield landfill | Agriculture | Recreation | |
| | Stockton Lake, Cedar Creek | Recreation | That they be there | Economy | Recreation and economy | No | | | |
| Water quality is still very good. Some signs of degradation can be observed from time to time. | All tributaries to Stockton Lake need to be protected | Fishing, trapping, water recreation | Future population growth and its associated pressure on W.A. | Recreation, open space, livestock and wildlife watering | Drinking water mostly from wells, water table impacts | Nonpoint sources, unidentified sources of unidentified pollutants | Water quality study | Identify actual sources of pollutants causing | Impairments, long standing advisory committee formed and maintained |
| We are fortunate to have the resources we have | | Water resource for city; lake provides food (irrigation), recreation (fishing) | Management | All of the above | Irrigation, drinking water | No | Manage for sustainablity | Volunteer planning for the future | Cooperation |
| | Cedar Creek, Sac River | Drain region, fishing, floating | | | Irrigation | Inconsistent water release of Stockton Dam | | | |

| General Perception | Waterbody | Use | Primary Challenges | Primary Benefits | Community Uses | Upstream/ Downstream Activities | Priority #1 | Priority #2 | Priority #3 |
|---|---|---|---|---|---|---|---|---|---|
| Positive, good water source | Fellows Lake | Source for drinking water and livestock water and recreation | Monitor water source and maintain landowner property rights | Water source for people with animals, recreation and tourism | Drinking water source for people with animals, recreation (boating/fishing) | Residental runoff in minicipalites | No mandates, all voluntary programs | | |
| Heavily impacted. High nutrient load | Turnback Creek | Recreation | Poor land-use practices | Recreation, open space, ecological benefits | Livestock watering. Poorly | Poor farming practices leading to erosion, nutrient loading, stinky streams | Farmer education | Expansion of grant programs | |
| That they are clean | Stockton Lake, Sac River, Bear Creek, Spring Creek | Water recreation, economic driver, cattle watering | Having clean and safe water, bank erosion | Recreation, economy, ecological benefits | Recreation and cattle watering | NA | Lake Stockton reserved for storage for Stockton and Cedar County | Access to Sac River water for Stockton and farmers | Having a clean, safe watershed |
| | Sac River, Stockton Lake | Fishing, trapping and hunting | River access | | | Water generation | | | |
| Major contributor to lake | Stockton Lake | Recreation, some electricity generation although from my understanding Stockton does not obtain electric power from the lake, flood control | Keep them clean, sustaining the health and wellness of water | All of the above, ecological impact on wildlife | Boating, fishing, swimming, very important to local businesses and homeowners | Do not know any specific examples but highly likely example: pollution into streams, downstream use of large quantities of water | More education of general public | Promotion of activities to preserve or enhance water quality | Promotion of activities to conserve water resources |
| Being destroyed by the U.S. Army Corps of Engineers | | Recreation and farms | Erosion from the US Army Corps of Engineers power releases | Fauna | | Power generation | Shut down power generation on the Sac River | Protect archaeological sites | |
| Okay, concerned algae growth on lake | Stockton Lake | Recreation and power generation, fishing for consumption | Alage growth, NPS fertilizer runoff | Power generation, recreation, wildlife support | Same as 4, drinking water | Fertilizer runoff, in my opinion, causing algae bloom | Reduce nonpoint source fertilizer runoff | Increase recreation oppoutunity on river below dam, bike trails | Wildlife protection |
| Never hear anything about condition of Sac River. Suspect it and Stockton are polluted from excess fertilizer, herbicide and insecticide | My farm pond | Fishing, boating, drinking water | Nonpoint source pollution | Beauty, recycles water, sport boating/fishing, fish food source | Drinking, residential, fishing, boating, clean water improves community | Yes | Monitor water condition all along the drainage area | Reduce agricultural and power plant pollutants | |
| I have been around the country and the cleanliness is much higher than the majority of waterways in the country | | Recreational canoeing, kayaking, livestock | Keep farm animals from destroying water quality and habitat through broken fences | Green environments, native habitat, recreation and feeding livestock | It brings people, resources and revenue to our region | Continued monitoring of industrial runoff does help tremendously | Maintaining the safegaurds to keep our waters clean | Keeping our record of not ever having to close the beach because of E. coli and contaminants | |

## Meeting 2: Dec. 15, 2015, at Greenfield – 40 attendees, 23 survey respondents

| General Perception | Waterbody | Use | Primary Challenges | Primary Benefits | Community Uses | Upstream/ Downstream Activities | Priority #1 | Priority #2 | Priority #3 |
|---|---|---|---|---|---|---|---|---|---|
| Generally good water quality, sediment and nutrients | Stockton Lake | Fishing, livestock, recreation | Agriculture | Various, all the above | Drinking water | Not that I am aware of | Nutirents | Sediments in streams | Groundwater recharge |
| A biologically significant watershed, strongly affected by Stockton Dam | Stockton Lake | Conservation of endangered species especially freshwater mussels | The operation of Stockton Dam, nitrogen pollution, flow fluctuations, erosion | All the above, archaeological resources, biodiversity education | For biology department at MSU, study oppourtunites for students and faculty | Continuing abuse of the river downstream of Stockton Dam by peaking flows from hydropower generation | Consultation by USFWS with USACE (endangered species) | | |
| Sac River is polluted | Sac River | We don't live here | Cattle, poultry, abuse of sinkholes, sludge disposition | | | Cattle, poultry, abuse of sinkholes, sludge disposition | Control of pollution sources | | |
| Generally clean but has pollution from tourism and agricultural use | Sons Creek | Fishing, run to Sons Creek almost daily recreation | Probably water quality, pollution from fertilizer and tourists | Recreation brings visitors that improves economy | Recreation, improve economy | Tourism and fertilizer pollution | Water quality, improve tourism | | |
| Better condition than others like Table Rock and Lake of the Ozarks | | Recreation | Trash | Recreation | Irrigation | Organic fertilizer | Clean up streams | | |
| Waters are good | Stockton Lake | Recreation, power generation | Pollution | Recreation is good for local economy | Recreation, power supply | | Keep streams and creeks clean | | |
| Good but room for improvement | | Recreation, study of aqautic organisms, drinking water | Riparian zones, surrounding land use | Ecological benefits, economy, recreation | Drinking water, recreation—you wont appreciate it if you are not out in it | Dam changing water patterns | Smaller releases from the dam, more regulated, natural flows | Repair riparian corridors, limit sedimentation | Comprehensive ecological assesments |
| Fairly clean | Stockton Lake | Lake recreation, drinking water | Soil erosion | Recreation fishing, boating, power source | Drinking water, recreation | Yes, sewage fertilization | Less erosion | No two-stroke boat motors on lake | Reclaim used oil |
| | Stockton Lake, Sac River | Stockton Lake every weekend during summer for recreation | Keeping them clean, farmer protected land from causing trouble | Love its not commercialized and not too crowded | Recreation, many people enjoy our water and come from other places | I believe most landowners do a good job in protecting our resources | Keeing it clean if places like Springfield need drinking water | Have places for families to go | |
| Our streams and rivers in southwest Missouri are great | Rivers and streams in southwest Missouri | Fish, swim, just enjoy them | Excess nutrient and siltation/sediment, better than 30 years ago | All the above | Domestic use/industry | No | | | |
| Worried about pollution from Springfield landfill and sewage treatment affecting Sac River quality | Sac River and Little Sac | Recreation, livestock watering | Keeping livestock out of local rivers. Making use of sludge from Springfield treatment plants are not dumped in Dade County and watershed | All above and clean drinking water | Cropland in western part of watershed used for beans and corn. Drinking water | Landfill leakage in Greene County, dumping of sludge near creeks, have heard of incidents upstream on Turnback Creek in last couple of years | Monitoring of streams, Sac/Little Sac and Turnback Creek | Closer monitoring of CAFOs | Continued communication with DNR, Watershed Committee and MDC |
| Bald eagle habitat, animals, deer and beaver | Turnback Creek, Sons Creek, Sac River, Little Sac | Water cattle, camping, fishing, boating, crops | Paying to use areas as local residents | Recreation, agricultural | Gigging and fishing-Turnback, Sac River and boating swimming, camping Stockton | Downstream water for springfield | Maintain clean water | Public use | More information regarding sinkholes and how to map sinkhole areas |

| General Perception | Waterbody | Use | Primary Challenges | Primary Benefits | Community Uses | Upstream/ Downstream Activities | Priority #1 | Priority #2 | Priority #3 |
|---|---|---|---|---|---|---|---|---|---|
| Impaired but has lots of room for improvement | Sac River | I use local waterbodies and streams for recreation, floating and fishing | Maintain biodiversity through proper management of water flowing through the watershed from lake to Sac | The Sac River largely provides ecological benefits with added bonus of recreation/ economy | Municipal | I believe that improper management of water outflow from Stockton affects my use of the river and others by affecting aquatic organisms | More run of river dam management | Better riparian-zone management by landowners | Find ways to address nonpoint source inputs, septic, nutrient input, sedimentation |
| Ozark streams are vital component of the region's identity of outdoors recreation, hunting fishing. Most streams fit the image but some are losing this quality | | Rereation hunting, fishing is very important | Nutrient-input management, flow regimen from Stockton | Recreation and economic benefits linked to integrity of ecological systems | Clean drinking water | Pollution, land use, sedimentation, overharvesting of river fauna | Ecologically sound river flows from Stockton | Riparian-zone integrity | Whole system nonpoint source pollution management (nutrients/ sedimenation) |
| | Sac River, Stockton Lake | Recreation, drinking water | Nonpoint source pollution | Recreation, open space, ecological benefits (wildlife) drinking water | Same as 4, drinking water | Agricultural pollution use of herbicides, pesticides | Soil stabilization | Maintain water quality/biodiversity | Encourage reporting of required information and make sure businesses/individuals conform to existing legislation |
| Overall healthy but fragile | Stockton Lake, Turnback Creek | Primarily recreation, some agricultural uses tcok and irrigation | | Yes, all of these especially enjoy the wildlife and birding | Municipal and agricultural | I would like to be made aware of negative activities | Protection of water quality | Wetland maintenance | Continued public involvement in protection and monitoring |
| | Stockton Lake, Sac Tributeries | Hunt, fish, swim | People | All the above | Irrigation, potable wells | No | Educate | | |
| Mmostly clean, some trouble with Turnback Creek | Turnback Creek | Drinking and other home use, recreational, animals | Maintain steady, do not increase pollutants | Home use, economic use, recreation | Recreational | Yes | Control of pollution from CAFO operations | Maintain water quality | |
| Mostly in good shape but does have a lot of turbidity due to riparian removal | | Fishing, floating, hiking, swimming, drinking | Nonpoint source pollution, human development, groundwater protection | All above plus home use | Recreation provides revenue | Removal of riparian corridor, nonpoint pollution, CAFOs | CAFOS | Water quality | Education for general population on how their activities affect watershed and water quality |
| Some are clean and some are not, building restrictions on lake are good | | Lake recreation | Erosion | Recreation and open space | Drinking water and recreation | | Preserving groundwater quality | Perserving quality of Stockton Lake | Working with landowners and private groups |
| Very clean compared to Kansas | Turnback and Stockton Lake | Mainly agriculture, recreation at lake and drinking water | Public opinion, public use, potential nonpoint source pollution and wastewater in future | Agriculture | Agriculture, drinking water | Public wastwater facilities, dumping lagoons | Stream bank erosion control | Wastewater monitoring from cities | Help for the landowners in the watershed district (financial and legal) |
| We have an abundance of clean water but it can be improved quality-wise | Sac River, Little Sac and Stockton Lake | Water use for agriculture, recreation | Potential overuse, too many people, agriculture, septic systems | Recreation (lake) economy | Agriculture, recreation | I am not sure | Stockton Lake protection | Maintain current water quality and improve areas of concern | Balance use of land for all users |
| | Sons Creek | Water cattle, hunt and fish | | Wildlife and cattle | Drinking water | Mostly runoff from farms and factors | Keeping it clean | Runoff | Sinkholes |

## Meeting 3: Jan. 12, 2016, at Willard – 61 attendees, 24 survey respondents

| General Perception | Waterbody | Use | Primary Challenges | Primary Benefits | Community Uses | Upstream/ Downstream Activities | Priority #1 | Priority #2 | Priority #3 |
|---|---|---|---|---|---|---|---|---|---|
| | | Recreation, drinking water | Keeping them clean and changing old mindsets about water management | All of the above | Drinking, livestock, recreation | Improper management of wastewater systems in area towns of poor systems which are outdated or in need of repair. Improper waste management on farms, in particular poultry farms | Improving and maintaining an improved water quality | Stop contamination | Advanced planning to meet water needs (another lake) |
| That Greene County has more oppourtunity with the James River than Sac River | | | Low taxbase and uneducated community leaders | Agriculture, recreation | Drinking water, septic impact is old lines that contaminate groundwater | Illegal dumping, mostly past some present | Safe drinking water for all especially chronically ill and infants | Notifying the above mentioned as soon as water test reveals bacteria | |
| | | | | | | Urban sprawl | Erosion | | |
| | Little Sac | Livestock water | People throwing out trash | All of the above | Livestock, recreation | Only people throwing out trash | Keeping waters open for livestock owners | | |
| Some land erosion but overall seems healthy | Sac and Turkey Creek | Livestock water, recreation | Are any | Recreation | We are farmers, so community is different than what it seems like these questions are geared | City pollution | Not use my taxes wisely | Do not use my taxes as pre-empt for power | Clean up the pollutants from cities and towns like cigarettes |
| My community loves and cares for Stockton Lake and the Sac River. Most of the people in my area utilize them | Sac River and Stockton Lake | Fishing, boating, farming, hunting | Flooding, drought | Recreation, ecological benefits | Fishing, farming | No | | | |
| Streams are trashy | Sac and Little Sac | Cattle water, fishing | Clean them up | Open space | Stock water, garden water | No | Keep the chicken and turkeys houses away from them | | |
| Generally good water quality especially Turkey Creek, not so much Little Sac | Little Sac and Turkey Creek | Recreation | Bank erosion, flood waters | Recreation, perserving for next generation | Personal and livestock | Yes | Upstream pollution solutions, landfill, wastewater plan | | |
| It is directly connected to our water sources | Fellows and McDaniel Lake | Drinking water | Quality is good but a challenge to maintain; small watersheds, quantity can be an issue | Drinking water, quality of life, economic prerequisite, recreation | See #4 | Yes, always | Sustain/protect for drinking water | | |
| Livestock water | | | | | | | | | |
| | Fishing, boating | Keeping them clean | Recreation, green space | | Debris floating down | Education of the public to keep it clean | Better building codes to help with runoff | | |
| | Turkey Creek | Livestock water | Erosion | Economy | Livestock water and drinking water | | | | |

| General Perception | Waterbody | Use | Primary Challenges | Primary Benefits | Community Uses | Upstream/ Downstream Activities | Priority #1 | Priority #2 | Priority #3 |
|---|---|---|---|---|---|---|---|---|---|
| Accessible contributor to the quality of life | Sac, Fellows, McDaniel, Stockton Lake | Canoeing, fishing, hiking, boating | Pollution | Recreation | Private, community pool | | Pollution cleanup | Education | conservation |
| | Sac River and Little Sac | Cattle, fishing, boating canoeing | Being clean | Recreation | Fishing, recreation for furture generations | Chicken farms | Less poultry farms | | |
| | Stockton Lake and branches | Wildlife stability, horses and cattle | Excessive flooding at least 4 times annually | Open space, ecological benefits | Provide stability of well-water levels, provides recreation and lake living | Erosion | Provide guidelines for big business which impose penalties | Ease access to funding for use of water feeders vs. use of waterways by livestock for drinking water | |
| | Sac, Stockton Lake, Clear Creek | Fishing, swimming, boating | Pollution | Recreational | Drinking from groundwater | Farming, raising cattle, stormwater runoff from towns and city | Better stormwater management in cities | | |
| Good | Asher Creek | Enjoyment, growing trees along streambank, talking walks | | Livestock and wildlife water source | Residential none as city willard sanitary goes to Springfield and also have pasture as buffer | No | | | |
| The condition of Sac River is fair to poor. There is too much direct contact to the waterway from cattle | Sac River | As a water resource | Agriculture, stormwater and septic tank effluent runoff | Recreation, economic, drinking water, floodwater management | Potable water, groundwater resources, agriculture useage | Yes | Enhance protection of Stockton Lake | Financial support, incentive programs for sustainable ag | promotion of best management practices for land use and development |
| More education | Cedar County, Cedar Creek | Livestock, recreation, life itself | Keep it clean, useable and controled | All of the above and more | Answered in above | All | Available | Clean | harvested education/ demonstration |
| Overall in good health | Sac River and tributaries | Irrigation, swimming, fishing, water for livestock | River bank erosion, flood control | Benefit is defined by the individual landowner | Farm is not located near community | Erosion of individual rights by governmental agencies | River/stream bank erosion | Flood control | maintain rights of the individual landowner |
| Large urban areas getting polluted | | Recreation, fishing, good source of revenue from trouism/ recreation | Water supply for Springfield affects us all | Good drinking water, recreation | Residential and business use, agriculture, recreation, dams make our electricity | None in my area | Springfield landfill runoff particularly disposal of those new mercury lightbulbs | Regular input from landowners/business | municipal sewer systems that are not handiling capacity |
| Drinking water supply and health related to waterborn pollutants and contaminants | Sac River | Recreation | Erosion, excess runoff, nonpoint pollutants due to karst topography | Industry and jobs, recreation, economy, health of forests related to economy and erosion control and drinking water | Drinking water, industry, overall health and quality of life for citizens. Everyone drinks water | I previously lived downstream from development of the James River Freeway. There was exessive flooding into Lake Springfield causing | Monitor residental watering systems, runoff agricultural, chemical | Look for creative drainage solutions such as rain gardens and permeable parking surfaces | |
| General perception is good | Flint Hill Branch | Wade in creek on my property at South Dry Sac along trail | Increased bacteria loading probably from septics/livestock | Recreation, ecological benefits, drinking water | Recreation, drinking water, agricultural | | Better protection of sinkhole and streams from livestock | Incentive program to improve septic systems | |
| As stewards of the natural resources, all waters are important to protect and preserve | Sac River, Clear Creek, Asher Creek, Stockton Lake | Recreation, economic development, to help recharge aquifers | Keeping them clean, ensuring their existence in the future as water use increases with population | Fishing, swimming, boating, agricultural, wildlife, power generation | Potable water, mining, agriculture, survival, economic development | Wastewater discharge | Increased monitoring and money for programs to repair and maintain wastewater systems | Increased fines for illegal dumping of trash, tires, TVs, couches | increased education, public awareness, stiffer design criteria for sewage disposal systems |